

## TRANSMITTAL OF APPEAL BRIEF (Large Entity)

Docket No.  
R.304250

In Re Application Of: Thorsten MAYER et al.

Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
10/534,125	November 18, 2005	T. Nguyen	02119	3748	8479

Invention: METHOD FOR AFTER TREATMENT OF EXHAUST GASES, AND EXHAUST GAS AFTER TREATMENT ARRAY

COMMISSIONER FOR PATENTS:

Transmitted herewith is the Appeal Brief in this application, with respect to the Notice of Appeal filed on:  
January 22, 2007

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Dated: March 22, 2007

Ronald E. Greigg  
Registration No. 31,517

GREIGG & GREIGG, P.L.L.C.  
1423 Powhatan Street, Unit One  
Alexandria, Virginia 22314  
Telephone: 703-838-5500  
Facsimile: 703-838-5554

CC:

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re patent application of

Thorsten MAYER et al.

Before the Board of Appeals

Serial No. 10/534,125

Art Unit: 3748

Filed: November 18, 2005

Examiner: T. Nguyen

For: Method For After Treatment of Exhaust Gases, And Exhaust Gas After Treatment Array

**APPELLANT'S BRIEF (37 CFR 41.37)**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Date: March 22, 2007

Sir:

This Brief is filed in support of the Notice of Appeal filed on January 22, 2007,  
appealing the Examiner's decision of making final a rejection of claim 11-28 and 30.

The fee for this Appeal Brief of \$500 should be charged to Deposit Account No. 07-  
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I - REAL PARTY IN INTEREST

The real party in interest in this appeal is:

Robert Bosch GmbH

Zentrale Patentabteilung

Postfach 30 02 20

D-70442 Stuttgart, Germany

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**II - RELATED APPEALS AND INTERFERENCES**

With respect to other appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal, there are no such appeals or interferences. None

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**III - STATUS OF CLAIMS**

**A. TOTAL NUMBER OF CLAIMS IN APPLICATION - Twenty (20)**

Claims in the application are: 11-30.

**B. STATUS OF ALL THE CLAIMS**

1. Claims canceled: 1-10.
2. Claims withdrawn from consideration but not canceled: None.
3. Claims pending: 11-30.
4. Claims allowed: 29.
5. Claims rejected: 11-28 and 30.

**C. CLAIMS ON APPEAL**

The claims on appeal are: 11-28 and 30.

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IV - STATUS OF AMENDMENTS

An amendment under 37 CFR 1.116 was filed on November 17, 2006. In an Advisory Action mailed December 5, 2006, the Examiner indicated that the amendment would be entered for purposes of appeal.

V - SUMMARY OF CLAIMED SUBJECT MATTER

In the following summary, all references to pages and lines relate to the English-language translation originally filed on May 6, 2005.

Independent claim 11 is directed to a method for posttreatment of the exhaust gas of an internal combustion engine, in which nitric oxides contained in the exhaust gas are selectively catalytically reduced (p. 1, ll. 10-17), the method comprising,

- delivering a first auxiliary agent (a urea-water solution) from a supply thereof to the exhaust gas (p. 4, l. 13-18),

- subjecting a portion of the first auxiliary agent at least intermittently to a chemical conversion into a second auxiliary agent (ammonia) ( p. 4, l. 18 through p.5, l. 2),

- storing the second auxiliary agent in an intermediate reservoir (4) ( p. 4, l. 18 through p. 5, l. 2), and

- at least intermittently, delivering the second auxiliary agent to the exhaust gas parallel to or in alternation with the first auxiliary agent (p. 4, ll. 6-11 and p. 5, ll. 14-19).

The chemical conversion is effected during the normal operating mode (p. 2, ll. 1-4 and p. 4, ll. 13-18).

The chemical conversion is performed only until such time as the intermediate reservoir is full (p. 2, ll. 13-14).

The volume of the intermediate reservoir is dimensioned such that a quantity of second auxiliary agent that meets the demand for the second auxiliary agent during a cold-starting phase of the engine is stored (p. 2, ll. 9-12).

The substance that releases ammonia at sufficiently high temperatures is used as the first auxiliary agent (p. 4, ll. 12-13).

The second auxiliary agent is ammonia (p. 4, ll. 12-13).

A zeolite body or a salt that forms an ammonia complex is used as the intermediate reservoir (p. 5, l. 21; p. 6, l. 9).

Independent claim 30 is directed to an apparatus (the sole figure of drawings) for posttreatment of the exhaust gas of an internal combustion engine, with which nitric oxides contained in the exhaust gas (located in exhaust gas line 20) is selectively catalytically reduced, and a first auxiliary agent (urea-water solution) kept on hand (in tank 1) is delivered (via line 11, pump 8 and metering device 16) to the exhaust gas, characterized in that means (line 2, reactor 3, line 9) are provided for at least intermittently subjecting a portion of the first auxiliary agent to a chemical conversion into a second auxiliary agent (ammonia), and that an intermediate reservoir (4) is provided for storing the second auxiliary agent, so that at least intermittently, the second auxiliary agent is delivered (via line 10 and metering device 15) to the exhaust gas parallel to or in alternation with the first auxiliary agent (p. 4, ll. 6-11 and p. 5, ll. 14-19).

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**VI - GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

Claims 11-20 and 30 stand rejected under 35 U.S.C. 103(a) as unpatentable over Krutzsch et al (US 5,921,076) in view of Akama et al (US 2002/0038542).

Claims 21-26 stand rejected under 35 U.S.C. 103(a) as unpatentable over Krutzsch et al in view of Akama et al and further in view of design choice.

Claims 27 and 28 stand rejected under 35 U.S.C. 103(a) as unpatentable over Krutzsch et al in view of Akama et al, design choice and Kinugasa et al (US 6,109,024).

## VII - ARGUMENTS

### A. The rejection of claims 11-20 and 30 under 35 U.S.C. 103(a) as unpatentable over Krutzsch et al in view of Akama et al

#### Claims 11-20 and 30

Krutzsch et al teaches a process for reducing nitrogen oxide content in oxygen-containing emissions of internal-combustion engines, the nitrogen oxide content being reduced on a catalyst by means of a reducing agent added in a metered manner to the exhaust gas as a function of operating temperatures, said process comprising: operating the engine in a first operating range with only hydrogen being supplied as a reducing agent to the exhaust gas upstream of the catalyst, operating the engine in a second operating range with both hydrogen and hydrocarbons being supplied as reducing agents to the exhaust gas upstream of the catalyst, and operating the engine in a third operating range with only hydrocarbons being supplied as a reducing agent to the exhaust gas upstream of the catalyst. See, claim 1.

At col. 2, beginning at about line 56, Krutzsch et al teaches that:

[a]ny arrangement for generating or storing hydrogen can be used as the H<sub>2</sub> generator 6. Particularly for a use in motor vehicles, the electrolysis of water, the generating of cracked gas or the reforming of methanol can be used for this purpose. Different possibilities are also known for providing the hydrocarbons. On the one hand, fuel can be entered into the exhaust gas pipe 2 in a metered manner. In this case, the HC generator 5 is constructed as a simple metering valve. In addition, it is also possible to prepare the fuel before the introduction into the exhaust gas pipe 2 in order to produce more reactive hydrocarbons. This is advantageous because, in the case of platinum-containing catalysts, mainly short-chain, unsaturated hydrocarbons are suitable for the NOx reduction. In this case, the HC generator 5 is constructed as an apparatus for preparing the fuel. Apparatuses for the catalytic or thermal cracking of fuel, for example, are suitable for this purpose.

In the final rejection, the examiner describes Krutzsch et al as teaching a method similar to that defined by appellants' claim 11 comprising the steps of:

"- delivering a first auxiliary agent (HC) from a supply (5) thereof to the exhaust gas;  
- subjecting an hydrogen producing fluid (water, methanol, HC) at least intermittently to a chemical conversion (in hydrogen generator (6)) into a second auxiliary agent (hydrogen) (see lines 56-60 of col. 2);  
- storing the second auxiliary agent in an intermediate reservoir (6) (lines 56-60 of column 2); and  
- at least intermittently, delivering the second auxiliary agent to the exhaust gas parallel to or in alternation with the first auxiliary agent (see lines 11-30 of column 2 and Figures 3-4)." (Final Rejection, page 3)

The appellants take issue with the examiner's description of the teachings found in Krutzsch et al. The examiner says that col. 2, lines 56-60, teach the steps of subjecting a hydrogen producing fluid at least intermittently to a chemical conversion into a second auxiliary agent and storing the second auxiliary agent in an intermediate reservoir. This is not the case.

Col. 2, lines 56-60, teach that "[a]ny arrangement for generating or storing hydrogen can be used as the H<sub>2</sub> generator 6. Particularly for a use in motor vehicles, the electrolysis of water, the generating of cracked gas or the reforming of methanol can be used for this purpose." In the first quoted sentence, Krutzsch et al. uses the words "generating or storing," not generating and storing. The second quoted sentence describes arrangements for generating hydrogen, but does not teach or suggest that the hydrogen so generated is then stored.

Krutzsch et al does teach that hydrocarbon fuel (HC) (not hydrogen) can be stored in a second catalyst 8 (see, col. 3, ll. 60-62). However, there is no teaching of storing hydrogen generated by the hydrogen generating device.

After having read the appellants' specification, the examiner is obviously reading more into the teachings of Krutzsch et al than is actually present. Krutzsch et al teaches generating hydrogen or storing hydrogen, but Krutzsch et al does not teach or suggest generating hydrogen and then storing the hydrogen so generated as required by claim 11.

Likewise, Krutzsch et al does not teach or suggest an apparatus of the type recited in claim 30 including a first auxiliary agent kept on hand for delivery to the exhaust gas, means for at least intermittently subjecting a portion of the first auxiliary agent to a chemical conversion into a second auxiliary agent, and an intermediate reservoir provided for storing the second auxiliary agent, so that at least intermittently, the second auxiliary agent can be delivered to the exhaust gas parallel to or in alternation with the first auxiliary agent.

The Board's attention is also directed to the fact that the antecedent for the words "the second auxiliary agent" in the step of "storing **the second auxiliary** agent in an intermediate reservoir (4)" is found in the preceding step of "subjecting a portion of the first auxiliary agent at least intermittently to a chemical conversion into **a second auxiliary agent**."

Krutzsch et al teaches the use of fuel as an auxiliary agent to be added to the exhaust gas, but there is no teaching of subjecting the fuel to a chemical conversion to generate hydrogen. Instead, Krutzsch et al teaches that hydrogen can be generated using water, the cracking of gas or the reforming of methanol. Thus, if anything, Krutzsch et al actually

teaches away from using "a first auxiliary agent" (in Krutzsch, fuel) to generate "a second auxiliary agent" (in Krutzsch, hydrogen).

The examiner has applied Akama et al in an effort to fill the deficiencies of Krutzsch et al, but Akama et al does not teach using a first agent, and then also converting a portion of this first agent to a second agent, with or without intermittently supplying the second agent to the exhaust line. Akama et al applies only one agent to the exhaust line, and thus does not teach or suggest anything like the recitations of claim 11, wherein **a first reducing agent is converted to a second reducing agent, and these two agents are used as appropriate** for posttreatment of the exhaust gas of an internal combustion engine. Nor does Akama et al teach or suggest an apparatus of the type recited in claim 30 including a first auxiliary agent kept on hand for delivery to the exhaust gas, means for at least intermittently subjecting a portion of the first auxiliary agent to a chemical conversion into a second auxiliary agent, and an intermediate reservoir provided for storing the second auxiliary agent, so that at least intermittently, the second auxiliary agent can be delivered to the exhaust gas parallel to or in alternation with the first auxiliary agent.

To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). Neither Krutzsch et al nor Akama et al teaches or suggests a method of the type recited in claim 11 in which a first reducing agent is converted to a second reducing agent, and these two agents are used as appropriate for posttreatment of the exhaust gas of an internal combustion engine or an apparatus of the type recited in claim 30 including a first auxiliary agent kept on hand for delivery to the exhaust gas, means for at least intermittently

subjecting a portion of the first auxiliary agent to a chemical conversion into a second auxiliary agent, and an intermediate reservoir provided for storing the second auxiliary agent, so that at least intermittently, the second auxiliary agent can be delivered to the exhaust gas parallel to or in alternation with the first auxiliary agent. Accordingly, claim 11 and its dependent claims and claim 30 are not rendered obvious by the combined teachings of Krutzsch et al and Akama et al.

Further, the secondary reference to Akama et al is a special case designed for particular engines in which the operating temperature of the exhaust gas never reaches above 250<sup>0</sup> C. Thus, it is not appropriate to consider the reference to Akama et al as a reference which teaches anything relevant to the engine of Krutzsch et al, as the engines of these two references operate under entirely different conditions. Particularly, the engine of Akama et al never reaches the normal operating conditions of the engine of Krutzsch et al. See, for example, Krutzsch et al, col. 1, ll. 60-65 and claim 11.

To establish a *prima facie* case of obviousness, there must be some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. There is no suggestion to combine, however, if a reference teaches away from its combination with another source. A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant . . . [or] if it suggests that the line of development flowing from the reference's disclosure is unlikely

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to be productive of the result sought by the applicant. In re Gurley, 27 F.3d 551, 553, 31 USPQ2d 1130, 1131 (Fed. Cir. 1994).

Krutzsch et al discloses a process and apparatus for reducing nitrogen oxide in exhaust gases over a wide temperature range starting at approximately 100<sup>0</sup> C to above 350<sup>0</sup> C. See, col. 1, ll. 34-38 and claim 11. Akama et al is a special case designed for particular engines in which the operating temperature of the exhaust gas never reaches above 250<sup>0</sup> C. There is simply no teaching or suggestion in the applied references that the line of development flowing from the Akama et al's disclosure is likely to be productive of the result sought by Krutzsch et al.

#### Claims 13 and 14-17

Further, the Krutzsch et al reference lacks features which are particularly advantageous to the present invention, and are specifically recited in others of the claims. Claim 13 requires the conversion of the first auxiliary agent into a second auxiliary agent only during a normal operating mode of the motor vehicle so that for the next cold start of the engine the required amount of second auxiliary agent will already be available. The Krutzsch et al reference does not teach producing H<sub>2</sub> only during a normal operating mode of the engine, as recited in claim 13.

Since the Krutzsch et al reference lacks an intermediate reservoir, there is no way that this reference can be relied on to teach that such reservoir is dimensioned such that the quantity of second auxiliary agent stored in it suffices to assure removal of nitric oxides from

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the exhaust gas under special vehicle conditions, during which special conditions the first auxiliary agent would not achieve sufficiently adequate removal of nitric oxides, as recited in claim 17.

It is also particularly advantageous to perform the chemical conversion only until the intermediate reservoir is full, as this assures economical use of any electrical energy that may be needed, as recited in claims 14-16.

B. The rejection of claims 21-26 under 35 U.S.C. 103(a) as unpatentable over Krutzsch et al in view of Akama et al and further in view of design choice

Claims 21-23 include all of the language of claim 11 and further define the first auxiliary agent as a substance that releases ammonia at sufficiently high temperatures. Claims 24-26 include all of the language of claim 11 and further define the second auxiliary agent as ammonia.

Since these claims include the language of claim 11, the arguments previously set forth with respect to the rejection of claims 11-20 and 30 apply equally to claims 21-26.

Furthermore, neither of Krutzsch et al or Akama et al teach anything whatsoever to do with the use of ammonia as recited in claims 21-26.

In order to solve this deficiency in the teachings of Krutzsch et al and Akama et al the examiner finds that urea is a known reducing agent for removing NO<sub>x</sub> from a gasoline engine exhaust gas. See, Final Rejection, page 4. The examiner then concludes that it would have been obvious to have selected urea as the first auxiliary agent and ammonia as the

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second auxiliary agent, if one were to apply the teaching of Krutzsch et al and Akama et al to a gasoline engine.

Krutzsch et al teaches a process for reducing nitrogen oxide content in oxygen-containing emissions of internal-combustion engines, the nitrogen oxide content being reduced on a catalyst by means of a reducing agent added in a metered manner to the exhaust gas as a function of operating temperatures, said process comprising: operating the engine in a first operating range with only hydrogen being supplied as a reducing agent to the exhaust gas upstream of the catalyst, operating the engine in a second operating range with both hydrogen and hydrocarbons being supplied as reducing agents to the exhaust gas upstream of the catalyst, and operating the engine in a third operating range with only hydrocarbons being supplied as a reducing agent to the exhaust gas upstream of the catalyst.

The examiner proposes that it would have been obvious to substitute urea for hydrocarbons and ammonia for hydrogen in the process taught by Krutzsch et al, but there is no evidence of record that the nitrogen oxide content in the exhaust gases of a gasoline engine would be reduced on a catalyst as a function of operating temperatures with at least the same results obtained by the use of hydrocarbons and hydrogen taught by Krutzsch et al. The examiner's finding that urea and ammonia are equivalent to hydrocarbons and hydrogen in Krutzsch et al process is simply speculation.

To establish a *prima facie* case of obviousness based on a combination of the content of various references, there must be some teaching, suggestion or motivation in the prior art to make the specific combination that was made by the applicant. *In re Dance*, 160 F.3d

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1339, 1343, 48 USPQ2d 1635, 1637 (Fed. Cir. 1998); In re Raynes, 7 F.3d 1037, 1039, 28 USPQ2d 1630, 1631 (Fed. Cir. 1993); In re Oetiker, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). The mere fact that the prior art structure could be modified does not make such a modification obvious unless the prior art suggests the desirability of doing so. In re Gordon, 733 F.2d 900, 902, 221 USPQ 1125, 1127 (Fed. Cir. 1984). Suggestion arising from appellant's disclosure is impermissible as the basis for a rejection. In re Fritch, 972 F.2d 1260, 1266, 23 USPQ2d 1780, 1783 (Fed. Cir. 1992). The examiner's proposed combination of Krutzsch et al, Akama et al and design choice is clearly based on hindsight derived from reading appellants' specification.

C. The rejection of claims 27 and 28 under 35 U.S.C. 103(a) as unpatentable over Krutzsch et al in view of Akama et al, design choice and Kinugasa et al

Claims 27 and 28 include all of the language of claim 11 and further require that a zeolite body or a salt that forms an ammonia complex be used as the intermediate reservoir.

Since these claims include the language of claim 11, the arguments previously set forth with respect to the rejection of claims 11-20 and 30 apply equally to claims 27 and 28.

Further, Krutzsch et al has no intermediate reservoir. Hence, it is not seen how Kinugasa et al could possibly suggest that a zeolite body or a salt that forms an ammonia complex be used as the intermediate reservoir in Krutzsch et al where no intermediate reservoir exists.

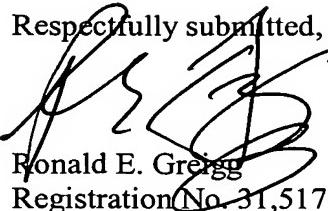
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Once again, the examiner's proposed combination of Krutzsch et al, Akama et al, design choice and Kinugasa et al is clearly based on hindsight derived from reading appellants' specification.

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**Conclusion**

For the reasons stated above, the appellants request that the Examiner's rejection of claims 11-28 and 30 be reversed.

Respectfully submitted,  
  
Ronald E. Greigg  
Registration No. 31,517  
Attorney for Appellants  
**CUSTOMER NO. 02119**

**GREIGG & GREIGG, P.L.L.C.**  
1423 Powhatan Street, Unit One  
Alexandria, Virginia 22314  
Telephone: 703-838-5500  
Facsimile: 703-838-5554

REG/JFG/hhl

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VIII - CLAIMS APPENDIX

Claims 1-10. (Canceled)

11. (Rejected) A method for posttreatment of the exhaust gas of an internal combustion engine, in which nitric oxides contained in the exhaust gas are selectively catalytically reduced, the method comprising,

delivering a first auxiliary agent from a supply thereof to the exhaust gas,  
subjecting a portion of the first auxiliary agent at least intermittently to a chemical conversion into a second auxiliary agent,  
storing the second auxiliary agent in an intermediate reservoir (4), and  
at least intermittently, delivering the second auxiliary agent to the exhaust gas parallel to or in alternation with the first auxiliary agent.

12. (Rejected) The method of claim 11, wherein, in a so-called normal operating mode of the engine, a delivery of the first auxiliary agent exclusively is effected, and wherein at selected time intervals outside the normal operating mode, in particular during a cold-starting phase of the engine, a delivery of the second auxiliary agent exclusively is effected.

13. (Rejected) The method of claim 12, wherein the chemical conversion is effected during the normal operating mode.

14. (Rejected) The method of claim 11, wherein the chemical conversion is performed only until such time as the intermediate reservoir is full.
15. (Rejected) The method of claim 12, wherein the chemical conversion is performed only until such time as the intermediate reservoir is full.
16. (Rejected) The method of claim 13, wherein the chemical conversion is performed only until such time as the intermediate reservoir is full.
17. (Rejected) The method of claim 11, wherein the volume of the intermediate reservoir is dimensioned such that a quantity of second auxiliary agent that meets the demand for the second auxiliary agent during a cold-starting phase of the engine is stored.
18. (Rejected) The method of claim 12, wherein the volume of the intermediate reservoir is dimensioned such that a quantity of second auxiliary agent that meets the demand for the second auxiliary agent during a cold-starting phase of the engine is stored.
19. (Rejected) The method of claim 13, wherein the volume of the intermediate reservoir is dimensioned such that a quantity of second auxiliary agent that meets the demand for the second auxiliary agent during a cold-starting phase of the engine is stored.

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20. (Rejected) The method of claim 14, wherein the volume of the intermediate reservoir is dimensioned such that a quantity of second auxiliary agent that meets the demand for the second auxiliary agent during a cold-starting phase of the engine is stored.
21. (Rejected) The method of claim 11, wherein a substance that releases ammonia at sufficiently high temperatures is used as the first auxiliary agent.
22. (Rejected) The method of claim 12, wherein a substance that releases ammonia at sufficiently high temperatures is used as the first auxiliary agent.
23. (Rejected) The method of claim 13, wherein a substance that releases ammonia at sufficiently high temperatures is used as the first auxiliary agent.
24. (Rejected) The method of claim 11, wherein the second auxiliary agent is ammonia.
25. (Rejected) The method of claim 12, wherein the second auxiliary agent is ammonia.
26. (Rejected) The method of claim 13, wherein the second auxiliary agent is ammonia.
27. (Rejected) The method of claim 11, wherein a zeolite body or a salt that forms an ammonia complex is used as the intermediate reservoir.

28. (Rejected) The method of claim 12, wherein a zeolite body or a salt that forms an ammonia complex is used as the intermediate reservoir.

29. (Allowed) A method for posttreatment of the exhaust gas of an internal combustion engine, in which nitric oxides contained in the exhaust gas are selectively catalytically reduced, the method comprising,

delivering a first auxiliary agent from a supply thereof to the exhaust gas,  
subjecting a portion of the first auxiliary agent at least intermittently to a chemical conversion into a second auxiliary agent,

storing the second auxiliary agent in an intermediate reservoir (4), and  
at least intermittently, delivering the second auxiliary agent to the exhaust gas parallel to or in alternation with the first auxiliary agent, wherein the intermediate reservoir, for being heated or for expelling the second auxiliary agent, is intermittently subjected to exhaust gas.

30. (Rejected) An apparatus for posttreatment of the exhaust gas of an internal combustion engine, with which nitric oxides contained in the exhaust gas is selectively catalytically reduced, and a first auxiliary agent kept on hand is delivered to the exhaust gas, characterized in that means (3, 6, 9) are provided for at least intermittently subjecting a portion of the first auxiliary agent to a chemical conversion into a second auxiliary agent, and that an intermediate reservoir (4) is provided for storing the second auxiliary agent, so that at least intermittently, the second auxiliary agent is delivered to the exhaust gas parallel to or in alternation with the first auxiliary agent.

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IX - EVIDENCE APPENDIX

None

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X - RELATED PROCEEDINGS APPENDIX

None